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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*

for

SOIL CONSERVATION SERVICE RESEARCH**
JUNE 1949

EROSION CONTROL PRACTICES DIVISION

Subsurface Tillage increased Early Growth and Later Drought Injury on Sweet Corn - O. R. Neal, New Brunswick, New Jersey.-"Crops under different cultural treatments have shown different responses to the drought conditions. Sweet corn under subsurface cultivation practices was showing much better growth at the onset of the drought than was sweet corn on plowed land. The subsurface tilled plants, however, have shown far more drought injury. In general, the large and rapidly growing plants of any crop show evidence of water shortage before the smaller plants are effected. This presumably is a matter of the total water requirement per day being less with the smaller plants."

Soil Conservation Experiments Studied by Conservationists and Teachers - F. L. Duley, Lincoln, Nebraska.-"During the month several groups of technical men visited the project with a view to studying in more detail the equipment and methods being used in our experiments. The groups attending these one-day schools were:

(a) The Zone Men and others from the Regional Office.
(b) Soil Conservationists from the Indian Service, Department of Interior, in Oklahoma, Nebraska, North Dakota and South Dakota.
(c) Technicians from Districts in eight counties of central-eastern Nebraska.
(d) Class of County Agents, Smith-Hughes teachers, and teachers of veterans. Class in charge of Dr. T. H. Goodding.

Methods and Dates for Planting Kudzu in Alabama - E. C. Richardson, Auburn, Alabama.-"A study of different methods and dates of planting kudzu was started in 1944 and extended through February, 1949, covering a period of five years. The purpose of making this study was to determine the survival of kudzu planting in November, January and February, by using different planting methods.

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** All research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"The three methods of planting used were shallow furrow, deep furrow, and hole method. The shallow furrow method consisted of opening a furrow with a six-inch turn plow; placing plants upright adjacent to the perpendicular side of the furrow and holding them in place with a small amount of soil pulled in by hand. The planting furrow was then filled with soil by plowing a furrow with the wing to the rows covering the plants slightly.

"In the deep furrow method, planting was the same as in the shallow furrow method. In covering, a list was formed over the plants covering them three to four inches deep, which added protection to the plants during the winter months. In early spring before plants started growing, the crown of the list was removed with a drag.

"By the hole method, planting holes were opened with a mattock and the plants set entirely by hand. Plantings by the shallow furrow and the hole methods were made in Escambia, Butler, Lee, Chilton, Cullman, Randolph and Limestone Counties. Plantings by these methods were made on three planting dates; November, January and February. Plantings by the deep furrow method were made in Escambia, Chilton, Lee and Limestone Counties. Planting by this method was made only in November for the purpose of determining the value of winter protection.

"Survival counts were made usually in May or June following the planting season.

"Results: A higher survival of plants was obtained for the 1948-49 season than from any of the other planting seasons. Possibly the warm winter, which was free from hard freezes, was a factor resulting in higher survival. Better plants were available for planting. Plants were obtained from a grower near Camp Hill, Alabama (20 miles away), who delivered them immediately after digging. Most of the plants were approaching one-half inch in diameter and were 10 to 12 inches long. These sizes gave stronger plants than those previously obtained from commercial sources that were trimmed close for express shipment.

"Higher survivals were obtained from February plantings than were obtained from November plantings. Over the five-year period 53% of the plants planted in November survived, whereas 68% of those planted in February survived.

"Methods of planting did not greatly affect the survival of plants. Lower survivals were obtained by the deep furrow method in North Alabama. Deeper covering and the formation of crust in early spring killed many of the plants planted by this method. Crust formation was much worse on clay soils than on sandy soils.

"Lower survivals were obtained in North Alabama as compared with Central and South Alabama, particularly from November planted plants. There were very little differences in the survival of plants planted in different sections of the state when planted in January or February.

"Based on the results of this study, kudzu can be successfully planted anywhere in the State from November on through February, except possibly North Alabama. Slightly lower survivals may be expected from November planted plants than from plants planted in January or later."

Costs of Terrace Outlets - Dwight D. Smith, Columbia, Missouri.- "Analyses of terrace outlet costs on the McCredie Station indicate that the 'double soil depth' outlets are no more expensive per unit of drainage area than the conventionally constructed outlets. This is the result of using higher design velocities where the 12 to 14 inch depth of soil was fertilized than on outlets with only surface fertilization. Costs per square yard were higher for the smaller outlet, regardless of method. Two 'double depth soil' outlets seeded last October 1st had adequate cover for use 8 months after construction and seeding. The quality of grass on them was equal to that on the conventionally constructed outlets that were seeded in the fall of 1945. Early results indicate the application of lime may not be necessary for grass outlets on this soil that normally requires 6 tons per acre in the surface plow depth for growing excellent sweet clover.

Construction Costs on 4 McCredie Terrace Outlets

Fertilization Depth	Area in Sq.Yds.	Costs						
		Machinery	Power	Labor (1)	(2) Fertilizer	Seed (3)	Total	Per Sq. Yd.
Surface	2666	$3.43	$14.45	$40.00	$20.52	$2.06	$80.46	$0.030
Surface	5110	4.55	24.75	61.50	35.10	2.80	128.70	0.025
Surface & Subsurface	720	1.37	9.23	26.90	15.83	2.70	56.03	0.078
Surface & Subsurface	1470	1.79	15.33	25.50	26.70	6.04	75.36	0.051

(1) Labor at $1.00 per hour.
(2) Manure at $1.84 per ton and lime at $2.00 per ton.
(3) The first 2 outlets were seeded to redtop, timothy and bluegrass.

Soil Moisture in Relation to Various Types of Fallow - Torlief S. Aasheim.-"Soil moisture samples this spring showed the following percentages of soil moisture in the various types of fallow. These figures are averages of samples taken from triplicated plots to a depth of 5 feet.

Fallow Treatment	Percent Soil Moisture
Sprayed (2,4-D)	14.5
Sprayed (2,4-D), Fall chiseled	13.7
Sub-surface tilled	14.4
Sub-surface tilled, fall chiseled	15.0
One-wayed	13.4
Moldboard plowed	13.9

"Soil moisture samplings taken this spring from stubble which was bladed last fall and that which was not bladed last fall show an advantage in favor of the fall bladed plots. Fall bladed stubble averaged 11.3 percent of soil moisture to a depth of five feet and stubble which was not bladed last fall averaged 10.4 percent moisture per foot. During the period 1941 through 1947 fall tilled stubble averaged the same as untilled stubble."

Studies on Winter Management of Soil - C. S. Slater, Beltsville, Maryland.-"Land management during the winter months, too long neglected, should come in soon for the attention it deserves as a conservation study. Improvement in soil structure that results from adequate winter protection is the thesis of three papers by Hopp and Slater, in May 15, 1949 issue of the Journal of Agricultural Research. The complexity of the problem in its local phases is emphasized by McKay's report of winter injury by snow mold and scald on s tubble mulched wheat, in Summary Review of Monthly Reports, April, 1949.

"Tests of fall and winter protection as a means of promoting good structure were applied to nursery beds at Big Flats, New York, last fall. The following data are reported from samples taken this spring:

Winter Cover	Water Stability	Large Pores	Earthworms per sq. ft.	
	%	%	Grams	No.
5 tons mixed hay	22.5	6.5	4.8	9
5 tons Rotted straw	13.9	8.6	9.6	10.5
5 tons New straw	6.8	2.8	0	0
Bare	8.1	2.2	.8	1.5

"These data show a promising increase in water-stability, large pores and worm populations for the mixed hay and rotted straw mulches, while the winter cover of new straw apparently had no effect. Consequently, it appears that physical protection of the surface alone, as exemplified by new straw, was of secondary importance during the mild winter of 1948-49, and that factors related to the quality of the mulch were responsible in part for the improvement in soil structure and increase in worm population under the mixed hay and rotted straw."

Top and Root Yields of Sweet clovers in Relation to Seeding Dates - J. R. Johnston, Temple, Texas.-"The proper management of the sweetclovers in the highly calcareous clays of this area for maximum conservation and soil productivity is dependent on a more complete knowledge of the physiological reactions of the annual and biennial sorts under these specific environmental conditions. The present study in this connection consists of hubam (an annual), Madrid and evergreen (biennials) seeded at 6 different dates, Sept. 15, Oct. 15, Nov. 15, Feb. 15, March 15, and April 15.

"Root and top development of each variety seeded at different dates was determined on July 5th. The data obtained are reported in Table 1. In studying these data it must be kept in mind that the hubam variety had a mature seed crop on the 4 first seeding date plots; the Madrid variety seeded in the fall has had a small amount of bloom since June 5; the evergreen variety had not commenced to flower on July 5th.

"Study of these data show that root development of the biennials is much greater than that of the annual variety. Furthermore, it shows that Madrid has a more bulky root system at these growth stages than the evergreen variety. This may be reversed when the slower-growing evergreen becomes more mature. It has been observed that the evergreen variety has a thinner and longer tap root than the Madrid. This morphological characteristic needs to be studied in more detail since the deeper-rooted legumes are needed for sound soil and water management in the heavy dense clays of the Blackland area.

Table 1.--Root and top development of 3 sweetclover varieties seeded at 6 different dates.

Variety	Seeding Date	Pounds Dry Matter Per Acre		
		Tops	Root	Total
Hubam	9-15	2920	328	3248
"	10-15	3501	339	3840
"	11-15	3993	627	4620
"	2-15	3469	536	4005
"	3-15	1478	401	1879
"	4-15	666	315	981
Madrid	9-15	2251	1221	3472
"	10-15	3558	2046	5604
"	11-15	2610	1760	4370
"	2-15	3929	1659	5588
"	3-15	2037	1066	3103
"	4-15	1029	470	1499
Evergreen	9-15	3437	1619	5056
"	10-15	2895	1613	4508
"	11-15	2909	1487	4396
"	2-15	3533	914	4447
"	3-15	2262	885	3147
"	4-15	694	308	1002

Wheat Yield in Relation to Tillage Practices - C. J. Whitfield, Amarillo, Texas.-"Yields and test weights of wheat harvested from the stubble mulch plots on June 27 have been obtained as follows:

Table 1.--Yields and Test Weights of Wheat Harvested from Stubble Mulch Plots, 1949

Tillage	Yield Bu. per Acre	Test Weight Lbs. per Bushel
	Continuous Wheat	
Sub-tillage	19.4	57.7
Oneway plow	21.5	58.4
Moldboard plow	23.2	57.6
	Wheat on fallow	
Sub-tilled fallow	38.4	60.0
Delayed sub-tilled fallow	36.1	59.0
Oneway fallow	36.0	58.9

"This is the second of the eight years that the stubble mulch studies have been conducted at the Amarillo Station that subtilled continuous wheat has failed to outyield wheat on the moldboard and oneway plot plots. The lower yield is unquestionably due to a nitrogen deficiency, since nitrogen-deficiency these symptoms have been apparent on the subtilled continuous wheat plots throughout the spring. In the case of wheat on the subtilled fallow plots, symptoms have not been visible and yields proved to be as good as or better than those on the onewayed fallow plots.

"Daily gains made by steers on different kinds of pasturage during June -

Crested wheatgrass	1.9 lbs.
Reseeded mixed grasses	1.9 lbs.
Blue grama-buffalograss	1.5 lbs.

"Seed is maturing on crested wheatgrass and buffalograss. Protein values for these grasses are probably lower because of seeding, thus accounting for the somewhat lower gains made by steers on these grasses. Steers on blue grama-buffalograss pastures are 'spot grazing'. Buffalograss is shown preference to blue grama."

Runoff and Erosion Difference Due to Plot Variations - O. E. Hays, LaCrosse, Wisconsin.-"Runoff measuring equipment is now installed on 12 plots located on the Gugel farm near Madison. All plots are in grain (oats) this year under uniform treatment to determine inherent variations in plots and variations due to differences in past treatment. The entire area was in hay last year, however there was considerable variations in age of hay. During the fall of 1948, all plots were plowed so that a uniformity test could be made.

"Mr. Bay reports the following data from a storm which occurred on June 27 and 28. The total rainfallwas 1.67 inches with a maximum 20- minute intensity of 2.55 inches per hour.

Plot Number	Runoff, Inches	Soil Loss Tons/Acre
2	0.11	0.07
3	0.14	0.09
5	0.42	0.28
9	0.14	0.14
10	0.30	0.22
13	0.13	0.20
15	0.16	0.18
17	0.09	0.11
19	0.13	0.10
21	0.25	0.17
22	0.13	0.11
24	0.21	0.32
Average	0.18	0.16

"It is apparent that runoff is a very critical measure of differences between areas. Although other measurements would indicate the soil is quite comparable on the various plots, runoff varied as much as 400 percent and soil loss as much as 500 percent. At the time of the runoff, the grain was from 26 to 32 inches high, providing a good dense cover. The legume seedlings were from 3 to 10 inches high. The higher amount of runoff on plot number 5 may be influenced by the apparently poorer stand of grain on the lower half of the plot.

"A relatively large number of small plots have been established within each plot in order to adequately measure variations in soil productivity.

"It is planned that plots will be grouped on the basis of these uniform treatments and that regular treatments will be started this fall."

Wheat Yields in Relation to Four Different Tillage Methods - B. H. Hendrickson, Watkinsville, Georgia.-"The 1949 wheat yields secured by Mr. John R. Carreker and Aurelius P. Barnett on triplicated plots operated in a 3-year rotation of wheat-Kobe lespedeza, 2nd year wheat-volunteer lespedeza, and cotton are included in the following table. It covers a 6-year record and shows to what extent the use of 4 different land preparation tools affected the average wheat yields, 1944-49 period:

	Wheat Yields			
	Ripper	Disc Harrow	Disc Tiller	Disc Plow
	Bushels per acre			
1st year wheat, following cotton	22.7	21.1	24.0	23.4
2nd year wheat, following lespedeza	17.1	15.0	16.7	19.4
Average	19.9	18.0	20.3	21.4

"The fertilizer schedule for this particular experiment required a fall application of 300 pounds per acre of 0-14-10, and 100 pounds per acre of Nitrate of soda spring topdressing for both 1st and 2nd year wheat. The lack of adequate N in the fall for the 2nd year wheat seedlings, due to lespedeza residue tie-up of soil N, is reflected in the lower wheat yields. The disc plow method was the least affected, as the residue was almost completely turned under.

"The overall result is that the disc harrow method shows up to be somewhat the poorest, and disc plowing the best, by small margins, in terms of wheat yields."

Effect of Late Mowing On Sericea Lespedeza - "We have previously reported that the perennial legume, sericea lespedeza, may suffer some loss of plant vigor if mowed or grazed late in the growing season.

"Mr. William E. Adams' June 20, 1949 - 1st 1949 hay cuttings on triplicate sericea plots on Class III land confirms this prior observation, as shown in the following table:

Date of Hay Harvest - Sericea lespedeza on Class III land.

Treatment	First hay harvest June 20, 1949 tons/acre
1 hay crop + 1 seed crop, annually	2.00
2 hay crops, no hay after August 10th	1.55
3 hay crops, 1 crop after August 10th	1.15

Soil Organic Matter as Affected by Soil Management Practices - "Mr. G. W. Gosdin, graduate student of the University of Georgia analyzed replicate soil samples taken from certain of the Station's experimental rotation plots to supply data for his M. S. thesis. His organic matter data for Class III land soil samples collected before and after a 6-year period show the following interesting trends:

Rotation		Legume Base Crops	Row Crops	Percent Organic Matter		
				Before	After	Difference
19	3-year	2 years Kudzu, 1 hay cutting each year	1 yr. out of 3	0.759	1.114	+0.356
15	3-year	2 years lespedeza seed crops	1 yr. out of 3	0.995	1.251	+ .256
14	3-year	1 year lespedeza seed, 1 yr. hay	1 yr. out of 3	1.157	1.293	+ .137
20	4-year	1 year lespedeza seed, 1 year hay + 1 crop vetch green manure	2 yrs. out of 4	1.143	1.178	+ .064
10	2-year	1 crop crotalaria, 1 crop vetch green manure	each year	1.056	1.026	- .030
Method 1	1-year	None (check: continuous cotton)	each year	0.982	0.776	- .206

"It is quite apparent that leguminuous material - mostly in the form of residue-turned into the soil in conservation rotation practices, is capable of increasing the content of organic matter in Class III cropland in the Southern Piedmont. And also, that too frequent row cropping depletes the supply.

"Method of Analysis: Carbon content of soil samples was determined by the piper dry combustion method, and organic matter computed by multiplying carbon x 1.724 factor."

The Effects of Different Winter Cover Crops on Nitrate Nitrogen in the Soil of Tobacco Land -R. C. Dawson, College Park, Maryland.-"A 1-year rotation of tobacco grown on ridge rows after several different winter cover crops has been followed on the same plots for a number of years by Mr. Britt at the Soil Conservation Service Research tract at Beltsville, Md. The winter covers are: ryegrass, ryegrass and ammonium sulphate (20 lbs. of N per acre), bare, ryegrass and vetch, wheat and vetch, rye and vetch and vetch alone. The cover crops are plowed under at two different dates.

The early and late plowing was done on April 11 and May 11, respectively, in 1949. At the time of ridging for planting tobacco a 4-8-12mixture of commercial fertilizer is added at the rate of 1000 pounds per acre. The plots were sampled at 1 foot depths to a total depth of 3 feet on June 8-9 and again on June 23-24. Nitrate nitrogen content of plots under the different cover crop treatments is shown in the following table:

Mean nitrate nitrogen content (ppm) found in the top 3 feet of the 1-year rotation plots (1).

Ryegrass	Ryegrass & $(NH_4)_2SO_4$	Bare	Ryegrass & Vetch	Wheat & Vetch	Rye & Vetch	Vetch
2.99	3.16	3.54	3.64	4.97	5.37	6.83

(1) Differences required for significance at the 5%, 1% and 0.1% level are 1.57, 2.07 and 2.64, respectively.

"Cover Crops: Vetch alone yielded significantly more nitrates than any other winter covers with the exception of rye-vetch. At the other end of the scale were the ryegrass plots with the lowest mean nitrate content. The ryegrass plots were significantly lower than the vetch plots at the 0.1% level, the rye-vetch plots at the 1% level and the wheat-vetch plots at the 5% level. Other comparisons with ryegrass were not significantly different. The ryegrass, ryegrass plus ammonium sulphate, bare, and ryegrass-vetch plots were not significantly different from one another. The rye-vetch plots were higher in nitrates than the ryegrass or ryegrass plus ammonium sulphate plots (1% level) or the bare or ryegrass-vetch plots (5% level). The wheat-vetch plots were higher (5% level) than the ryegrass or ryegrass plus ammonium sulphate plots.

"Date of Sampling: The mean nitrate nitrogen content for all samples taken on June 2-3 was 3.40 ppm, while on June 23-24 it was 5.32 ppm. The increase at the later sampling date was significant at the 1% level.

"Depth of Sampling: The top foot of soil contained a mean nitrate nitrogen content of 7.25 ppm. which was significantly higher (0.1% level) than that for the 2nd and 3rd foot depths which contained 3.41 and 2.41 ppm., respectively.

"Replicates: The two replicates differed from one another (5% level) in nitrate content indicating a difference in soil or local conditions at the two locations."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. Schiff, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Precipitation of 2.91 inches was distributed over 15 days of the month. The largest amount on any one day was 0.66 inch.

"Mr. Dreibelbis reports that three different types of electrical soil moisture measuring units are being investigated. Additional soil moisture records are also being obtained with tensiometers. Due to consistently high temperatures and low precipitation during the month soil moisture values reached a minimum on June 24. Data for two watersheds on the Keene silt loam are given below:

Soil depth	Watershed 123 plowed, improved conservation practices		Watershed 127 disked, improved conservation practices	
	Soil moisture	Avail. storage	Soil moisture	Avail. storage
Inches	Inches/in.	Inches/in.	Inches/in.	Inches/in.
0-1	0.14	0.37	0.17	0.34
1-3	.15	.36	.21	.30
3-5	.17	.34	.24	.27
5-7	.19	.32	.16	.35
7-10	.27	.23	.27	.23
10-14	.28	.22	.29	.21
Soil moisture in 0-14" depth	2.81		3.07	
Available storage in 0-14" depth		3.98		3.71

"Mr. Schiff reports that infiltration curves are being summarized and envelopes of curves for the different soils and crops are being set up. The paper entitled "Surface Runoff Supply Estimates Based on Soil-Water Movements and Precipitation Patterns" has been completed and submitted for publication. A portion of the final paragraph is quoted as follows: "Potential infiltration curves can be used to estimate surface supplies to runoff. Infiltration is also the supply to the soil profile and all sub-surface type flows and can be used in developing information on soil-water movements. It should be possible to prepare potential infiltration curves for various antecedent soil moisture conditions in a given locality and superimpose these curves over storms of various types that have occurred or are expected to occur. One of the objectives of such an approach would be the development of information on surface supplies to runoff. Such an approach also leads to knowledge of soil-water movements and the influence of soil properties and land use on watershed performance, a major hydrologic objective."

Hydrologic Studies - R. W. Baird, Waco, Texas.-"Compared to a normal of 3.16 inches, precipitation for the month of June totaled 4.90 inches at Gage 69. Most of the rainfall occurred during two storm periods, one from June 9 through June 15, and the second from June 23 through June 26. Total rainfall during each of these storm periods was about 2-1/2 inches. Table 1 on the next page shows the total weighted rainfall, the runoff, and the difference for each of the stations now in operation. Stations Y, Y-2, Y-4, Y-6, Y-7, Y-8, and Y-10 are all areas with conservation practices. Stations W-1, W-2, W-6, and W-10 are areas with ordinary farm practices with straight rows. During the first storm period there was appreciably more rainfall in the area with conservation practices but,

Table 1.--Rainfall and runoff - periods 9-15 and 23-26 June 1949

Date	Station	Y	Y-2	Y-4	Y-6	y-7	Y-8	Y-10	W-1	W-2	W-6	W-10	SW-12	SW-17	C	D
	Acres	309	132	79.9	20.9	40.0	20.8	21.0	176	130	42.3	19.7	2.97	2.97	.579	1110
6/ 9	Rainfall	.197	.185	.182	.142	.117	.140	.204	.047	.004	T	.010	.260	.020	.107	.173
	Runoff	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	Difference	.1970	.1850	.1820	.1420	.1170	.1400	.2040	.0470	.0040	T	.0100	.2600	.0200	.1070	.1730
6/11	Rainfall	.692	.725	.720	.777	.642	.780	.688	.608	.678	.780	.520	.670	.580	1.159	.987
	Runoff	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0021	.0012
	Difference	.6920	.7250	.7200	.7770	.6420	.7800	.6880	.6080	.6779	.7800	.5200	.6700	.5800	1.1569	.9858
6/12	Rainfall	.210	.185	.181	.180	.251	.180	.180	.255	.297	.250	.370	.180	.260	.341	.254
	Runoff	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0003	.0000	.0000	.0000	.0000	.0277	.0158
	Difference	.2100	.1850	.1810	.1800	.2510	.1800	.1800	.2550	.2967	.2500	.3700	.1800	.2600	.3133	.2382
6/14	Rainfall	.752	.752	.756	.750	.771	.750	.759	.777	.780	.780	.780	.720	.780	.817	.760
	Runoff	.0001	.0000	.0000	.0000	.0000	.0000	.0056	.0080	.0151	.0139	.0820	.0000	.0000	.1241	.0993
	Difference	.7519	.7520	.7560	.7500	.7710	.7500	.7534	.7690	.7649	.7661	.6980	.7200	.7800	.6929	.6607
6/15	Rainfall	.595	.632	.657	.575	.517	.570	.708	.450	.422	.450	.380	.720	.420	.951	1.080
	Runoff	.0016	.0000	.0000	.0218	.0000	.0050	.0813	.0323	.0364	.0789	.0506	.0000	.0000	.3055	.3657
	Difference	.5934	.6320	.6570	.5532	.5170	.5650	.6257	.4177	.3856	.3711	.3294	.7200	.4200	.6455	.7143
Total	Rainfall	2.446	2.479	2.496	2.424	2.298	2.420	2.539	2.137	2.181	2.260	2.060	2.550	2.060	3.375	3.254
	Runoff	.0017	.0000	.0000	.0218	.0000	.0050	.0869	.0403	.0519	.0928	.1326	.0000	.0000	.4594	.4820
	Difference	2.4443	2.4790	2.4960	2.4022	2.2980	2.4150	2.4521	2.0967	2.1291	2.1672	1.9294	2.5500	2.0600	2.9156	2.7720
6/23	Rainfall	.178	.179	.178	.189	.188	.190	.172	.176	.204	.220	.180	.180	.170	.390	.339
	Runoff	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	Difference	.1780	.1790	.1780	.1890	.1880	.1900	.1720	.1758	.2040	.2200	.1800	.1800	.1700	.3900	.3390
6/24	Rainfall	1.175	1.133	1.115	1.158	1.232	1.160	1.087	1.286	1.072	1.080	1.060	1.030	1.320	.878	.886
	Runoff	.0088	.0000	.0018	.0479	.0548	.0009	.0468	.0878	.0676	.0975	.1150	.0000	.0216	.0295	.0383
	Difference	1.1662	1.1330	1.1132	1.1101	1.1772	1.1591	1.0402	1.1982	1.0044	.9825	.9450	1.0300	1.2984	.8485	.8477
6/25	Rainfall	.750	.762	.766	.760	.730	.760	.769	.732	.805	.770	.860	.760	.730	.665	.721
	Runoff	.0687	.0286	.0724	.0950	.2004	.0225	.1289	.1504	.1679	.2042	.2797	.0000	.0293	.1549	.2166
	Difference	.6813	.7334	.6936	.6650	.5296	.7375	.6401	.5816	.6371	.5658	.5803	.7600	.7009	.5101	.5044
6/26	Rainfall	.315	.318	.322	.311	.309	.310	.328	.303	.328	.320	.340	.330	.300	.346	.359
	Runoff	.0013	.0000	.0000	.0000	.0000	.0000	.0008	.0040	.0077	.0000	.0000	.0000	.0000	.0145	.0386
	Difference	.3137	.3180	.3220	.3110	.3090	.3100	.3272	.2990	.3203	.3200	.3400	.3300	.3000	.3315	.3204
Total	Rainfall	2.418	2.392	2.381	2.418	2.459	2.420	2.356	2.497	2.409	2.390	2.440	2.300	2.520	2.279	2.305
	Runoff	.0788	.0286	.0472	.1429	.2552	.0234	.1765	.2424	.2432	.3017	.3947	.0000	.0509	.1989	.2935
	Difference	2.3392	2.3634	2.3068	2.2751	2.2038	2.3966	2.1795	2.2546	2.1658	2.0883	2.0453	2.300	2.4691	2.0801	2.0115

even so, there was less runoff from the area with conservation practices than from the untreated area. The net result from these storms was that about 1/2 inch more moisture was available in the area for plant growth. During the second storm period the rainfall in the area without conservation practices was somewhat higher and the total amount of runoff was appreciably greater, so that for the second storm period actually more moisture was retained on the area with conservation practices from a lesser amount of rainfall. The two areas SW-12 and SW-17 had very small amounts or no runoff. A small amount of runoff occurred during the second storm period from SW-17 which is an area being returned to grasses for pasture. Apparently at the end of the period this area was in a condition where it could not take up a great additional amount of moisture quickly. The area SW-12 is a native meadow and as nearly as we can tell it still had a capacity to take up a considerable amount of water. None of the rains of these two periods was of unusually great intensity and the rates of runoff from all areas were quite low. Some further studies of these storms will probably give us additional information.

"On June 16, the percentage of moisture from 0 inch to 60 inches on cotton, corn, and oat stubble in the Y-10 area where conservation measures are applied was as follows: cotton, 34.4 percent; corn, 29.9 percent; and oat stubble, 30.5 percent. With the same crops on the W-10 area the percentages of moisture were: cotton, 29.7 percent; corn, 27.0 percent; and oat stubble, 24.4 percent. The percentage of moisture in the 0-60 inch depth on all three crops in the Y-10 area was 31.7 percent, while in the W-10 area, with the same crops, without conservation farming, the percentage of moisture was 27.1 percent, a difference of 4.6 percent in favor of the conservation-farmed area.

"Ammonium nitrate applied in February to fall-seeded oats increased the yields on Class II and Class III land and decreased the yield on Class I land. Rates of 1, 2, and 300 pounds of 32-percent ammonium nitrate on Class I land decreased the yield 2.3, 3.1, and 18.0 bushels per acre. The same rates on Class II land increased the yield 16.6, 14.6, and 21.0 bushels per acre. On Class III land, the yields were increased 15.8, 22.0, and 26.7 bushels per acre.

"The check areas, without the applications of nitrate, produced 53.9, 40.7, and 28.0 bushels per acre on Class I, II, and III land respectively.

"These results were obtained on duplicate tests on the Class I land at the time the oats were in the "milk stage," which resulted in a decrease in yield. No lodging occurred from the additional nitrate on Class II and Class III land."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"In June precipitation was recorded on 13 days, totaling 6.31 inches at the meteorological station. The precipitation for May and June totaled 13.17 inches, which is almost 6 inches above the long-time average for the 2-month period.

"The largest rain in June occurred on the evening of June 8, and varied from 1.80 to 2.02 inches, in the vicinity of the 4-acre watersheds, with the maximum 5-minute intensity ranging around 2.6 inches per hour. The maximum peak rates of runoff on June 8, for the small watersheds are shown in the following table:

Maximum Peak Rates of Runoff - Storm of June 8, 1949
in Inches per Hour

Straight row		Contoured		Subtilled	
Watershed No.	Peak rate In/hr	Watershed No.	Peak rate In/hr	Watershed No.	Peak rate In/hr.
		CORN			
4H	2.01	8H	0.58	11H	2.52
12H	2.40	17H	1.08	19H	1.96
				24H	1.31
Ave.	2.20		0.83		1.93
		OATS			
6H	1.59	7H	1.20	10H	1.69
15H	1.70	9H	1.78	20H	2.28
				23H	1.56
Ave.	1.64		1.49		1.84
		WHEAT			
		(Oats substituted for wheat in 1949)			
3H	2.34	5H	1.43	14H	1.92
16H	1.60	13H	1.80	21H	2.41
				22H	1.32
Ave.	1.97		1.62		1.88

"At about midnight on June 8, watershed W-8, containing 2,086 acres probably reached its maximum discharge in the past 11 years by a slight margin over the previously high. Two stream gaging parties spent the night making discharge measurements, hence it is felt that a good record will be obtained. The other three large gaging stations were below their previous peaks."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.-"Total rainfall for June was significantly above normal on the experimental watersheds at both the Throckmorton and Dairy Experiment Farms.

"A rain totaling approximately 1 inch at the Throckmorton Farm on June 21, produced runoff from experimental watersheds in both corn and wheat under the 'prevailing' treatment. There was no significant runoff from those in corn or wheat under the conservation treatment, nor from those in meadow. Another rain on June 28, totaling between 0.68 and 0.84, at various points on the Throckmorton Farm, produced substantial runoff from the watersheds in corn under 'prevailing' treatment and little or none from those in corn under the conservation treatment or those in wheat under either treatment.

"Hay was sample harvested on the experimental watersheds, June 14 and 15. The conservation treated watersheds averaged 5,050 lbs. per acre of good quality hay, compared with an average of 2,060 lbs. per acre of poorer quality hay from the 'prevailing' treated watersheds. Red clover on the 'prevailing' treated watersheds was noted to be severely affected by a disease which resulted in high loss of leaves and premature ripening; whereas red clover on adjacent watersheds under the conservation treatment was only slightly affected.

"Corn on the watersheds was cultivated only twice and is quite weedy. However, it looks good on the whole. Early, weed infestation looked to be most serious on the conservation treated areas, due to higher fertility level. Later on the corn on the conservation treated watersheds grew so much more rapidly than that on the prevailing treated watersheds, that the weed situation was reversed. The weeds in the conservation treated corn were held back by competition from the corn, while the weeds on the prevailing treated watersheds continued uninhibited.

"The surface mulched plots at Albion this spring, showed the necessity of some period, probably 10 days to 2 weeks between the initial tillage and planting, to secure killing of the grasses. This appears to be a rather critical point with this type of treatment, as too early efforts to subtill and kill the meadow, when the soil is too damp and the weather too cool, is also relatively ineffective and requires more operations to accomplish the job. Another observation has been that, while rolling soil and residue into rows in late cultivations is usually an effective means of killing weeds and grass in the rows, it is quite undesirable if grasses between the rows have not been previously entirely deadened.

"Hay plots at Albion were sample harvested and the results showed generally very good yields on all plots, with no significant differences due to tillage treatment of the preceding corn crop (2 years before). All yields exceeded 2 tons per acre of mixed grass and legume hay."

Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Michigan.-"As measured by the U. S. W. B. type of non-recording rain gage, precipitation for the month of June amounted to 5.67 inches at the cultivated watersheds, 3.43 inches at the wooded watershed, and 5.30 inches at the stubble-mulch plots. These amounts are approximately 162 percent, 98 percent, and 151 percent of the 50-year average June precipitation of 3.51 inches. Precipitation for the month of June, at the cultivated watersheds, can be expected to equal or exceed 5.67 inches once in 9 years, according to the frequency curves prepared from the 1864-1948 precipitation records at East Lansing. Cumulative rainfall for the year is approximately 118 percent of normal.

"During the month there were two runoffs from watershed B, and one from watershed A. Soil and water losses have not yet been computed for these runoffs, but were relatively minor.

"The manuscript for the proposed Michigan Agricultural Experiment Station's technical bulletin on solar radiation observations was completed and submitted to the Washington Office for release. At the same time, a copy was submitted to the Experiment Station for their clearance. This copy was presented to the Experiment Station council by Director Gardner, and was accepted for publication at an early date.

"The manuscript for a technical paper, in collaboration with Dr. George J. Bouyoucos, on "Soil Moisture Determination by the Electrical Resistance Method" was completed and released for publication by the Agricultural Experiment Station and the Washington Office, SCS."

Hydrologic Studies - T. W. Edminster, Blacksburg, Virginia.-"Messrs. Holtan and Kirkpatrick report that they are proceeding in the analysis of the Chatham watershed on the premise that rate of runoff is affected or influenced by both size of watershed and by retention but mass or total runoff is affected only by retention. Therefore by correcting all watersheds to a common total runoff for a given storm a correction factor was derived which could be applied to the peak rate for the respective watershed. Peak rates after correction in this manner did provide logical frequency curves, that is, smaller watersheds give greater and more frequent peak rates.

"Due to the manner of occurrence of rainfall intensities, it becomes obvious that many storms of great total runoff give relatively small peak rates. In order to refine these data it is intended that the above outlined procedure of correcting peak rates for retention and thereafter deriving the size factor be repeated using unit storms; that is, only that block of mass runoff which produced the peak being considered. This method has the further advantage that several peaks and unit storms can be obtained from what was formerly a single storm. The additional strength obtained by thus increasing the number of cases is sorely needed.

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation at Fennimore for the month was 8.85 inches, or about twice normal. The total runoff varied from 0.20 to 0.50 inch, and all was the result of the storm of June 24. Data for this storm is presented in tabular form below. The low amount of runoff is probably due to good vegetal cover at the time of the storm, although there was considerable erosion in the corn fields. The observer states that soil was eroded 6 inches between the corn rows, and some silt deltas appeared in the hay and pasture below these fields to a depth of 6 to 8 inches. The precipitation for the period of January to June is now about 3 inches above normal.

Fennimore, Wis. - Storm of June 24, 1949

Watershed	Drainage area acres	Total rainfall Inches	Total Runoff Inches	Maximum intensities for selected time Intervals, Inches per hour				Maximum rate of runoff
				5 min	10 min	15 min	20 min	
W-1	330	2.24	0.452		4.44		3.63	0.72
W-2	23	2.13	.219	5.40	4.20	3.60	3.36	.73
W-3	53	2.20	.216	4.80	4.08	3.72	3.54	.50
W-4	171	2.27	.456	4.80	4.80	4.20	3.66	1.00

"Precipitation at Edwardsville for the month was 6.53 inches, as compared with the normal of 4.10 inches. Of this amount, 4.36 inches came in less than 2 days, on the 26th to 28th. Total runoff for the month was 1.76 inches from the 28-acre cultivated watershed, and 1.50 inches from the 50-acre pasture watershed. The storm of June 28 produced the fourth highest rate of runoff from the cultivated area. No data for this storm is available on Watershed W-4, although one rain gage on this area shows a catch of 1.80 inches in 20 minutes. Data for this storm on Watersheds W-1 and W-2 are given in the table below. A new observer was employed for the Edwardsville study beginning June 27."

Edwardsville, Ill. - Storm of June 28, 1949

Watershed	Drainage area Acres	Total rainfall Inches	Total runoff Inches	Maximum intensities for selected time intervals, Inches per Hour				Maximum rate of runoff
				5 min	10 min	15 min	20 min	
W-1	28	1.70	0.88	5.40	4.50	4.16	3.69	2.05
W-2	50	1.98	.91	6.60	5.10	4.60	4.26	1.63
W-4	290	2.10						

Drainage Studies - E. G. Diseker, Raleigh, North Carolina.-"Plymouth Experiment--Two rows of Kudzu were planted on the banks of the McRae Canal in early May. One row was placed on each side of the canal bank, at the top of the bank slope, from the highway to the south end of Plot E. Plants were spaced about 6 feet apart in the row. Recent observations of the upper end of the canal show that most of the Kudzu is living and growing nicely. Some of the Kudzu, particularly that on the east bank, on the old, undisturbed roadway will have considerable competition due to honeysuckle and bushes. Kudzu plants were made available by the local Soil Conservation Service technician at the request of the writer. It is hoped that the kudzu will not only stabilize the banks, but will also keep the bushes and trees from growing on the banks.

"The 10 ditches which were constructed approximately 3 feet deep and 19 inches wide with the trenching machine, were cleaned by means of hand shovels in March. Each ditch is 475 feet long. Two of these ditches were side sloped 2 years ago by means of hand shovels, and have a side slope of 1/2 to 1. The side sloped ditch banks were covered with grass and weeds. Those which have vertical or under cut bank, only had vegetation coverage about the upper 1 foot of the bank. The two ditches with side sloped banks had soil deposits from 2 to 4 inches deep, and required 7 man hours per 475 feet in length for cleaning. Ditches without side slopes contained deposits of 3 to 6 inches and required 10 man hours per 475 feet of ditch for cleaning. Soil deposits were greater than those last year and labor requirements were 4.6 times greater for cleaning the sloped ditches than it was last year. Likewise, the labor required for the unsloped ditches was 2.4 greater than that for last year.

"Bethel Experiment--The nine small, open ditches, constructed with the trenching machine, which have the same dimensions as those at the Plymouth station were cleaned out with hand shovels in March. All ditches constructed with the machine have vertical or undercut banks. Soil deposits ranged from 3-1/2 to 4 inches deep, which was about the same as last year. However, the ditch in the quick sand area had deposits of about 1 foot in depth. These ditches required 6.5 man hours per 475 feet of ditch, not including the quick sand area, for cleaning. This was an increase of 1 man hour per 475 feet length of ditch over last year's requirement.

"Four blasted ditches required cleaning this year for the first time with the exception of sand deposits at the junction of the old ditches which were filled when the experiment was installed. Blasted ditches required 6.6 man hours per 475 feet length."

Drainage Studies - J. C. Stephens, West Palm Beach, Florida.-"During June, rains, typical of our subtropical summer season, occurred in the area, and the water table rose generally over the Everglades. The stage in Lake Okeechobee rose approximately 0.6 foot and on croplands now in cultivation intermittent pumping for drainage was required.

"For June, 9.29 inches of rain fell at the Everglades Experiment Station and evaporation from the standard pan was 6.192 inches. The mean maximum temperature was 89.4 degrees, and the mean minimum temperature was 67.9 degrees.

"Experiments were made to determine the roughness coefficient "n" in Kutter's formula and n' in Manning's formula on two drainage ways. One was a main lateral approximately 50 feet wide in the East Shore Drainage District near Pahokee, Fla., and the other a farm lateral approximately 20 feet wide near Ft. Lauderdale, Fla. Descriptions of each are given in the table on the next page.

"Elevations were established on permanent bench marks in the edge of the channel at the upper and lower ends of the slope courses. Because of the very low slope of the water surface found in canals of the Everglades, extreme care was taken to establish levels as accurately as possible. Level circuits were run as many times as necessary. All levels were run in calm periods during the early morning before heat refraction became a problem. A dumpy level was used, balancing all shots, which were limited to 250 feet. On the East Shore slope course water levels were obtained from clam still water to check and supplement the instrument levels. For the 1,000 foot Osborne "course" mean elevations were established from 9 runs to within a probable error of + or - 0.0015 foot, and on the 2,772 foot East Shore "course" from 14 runs to within a probable error of + or - 0.0028 foot.

"Eleven cross sections, spaced at uniform intervals were made on each course. In making the cross sectional measurements, distances across the channel were made to the nearest tenth of a foot. Elevations on the sides and bottom of the channel were taken with a level and rod to the nearest tenth of a foot, and were taken at regular intervals of 2 feet on the larger channel and at 1 foot intervals on the smaller channel, and at all points where a change in slope was apparent.

"Flow was measured with a Price current meter attached to a wading rod. Discharge measurements were usually made consecutively on both the upper and lower ends of each course to determine what, if any, seepage inflow occurred throughout the length of the reach and also to serve as a check on the accuracy of the measurements. Measurements were made at 2 -foot intervals across the 20-foot channel, and at 4-foot intervals across the 50-foot canal, with closer spacing near each bank. The 0.2 and 0.8 depth method was used in water over 2 feet deep, and the 0.6 depth method in water less than 2 feet deep. Differences in the discharge measured at the two stations were less than 3 percent, and the mean of the measurements was used for "Q" in computing values of "n." Elevations at the water surface were taken as nearly simultaneously as possible at each end of the reach before and after each discharge measurement. The mean of these readings was used to determine the average stage and slope for each test. A stilling well and hook gage were used to obtain the elevations of the water surface from the reference bench marks to the nearest 0.001 of a foot.

"The cross sectional measurements were plotted on cross section paper on a scale of 2 feet to the inch and the areas and wetted perimeters obtained for each section by means of planimeter and scale. The mean cross sectional areas and hydraulic radii were obtained by taking the weighted average for all sections using the formula:

$$A = \frac{a1 + 2a2 + 2a3 + 2a4 + 2a5 + 2a6 + 2a7 + 2a8 + 2a9 + 2a10 + 2a11}{}$$

Table 1.—Results of experiments in the Everglades area, East Shore Drainage District main pump lateral near Lake Okeechobee, length of reach tested, 2,772 feet

Date of observation	Average max. depth	Average surface width	Flow	Average X-section area	Mean velocity	Mean hydr. radius	Slope	Coefficients		
								Chezy C	Manning n'	Kutter n
	feet	feet	sec.ft.	sq. ft.	ft.-sec.		ft.-ft.			
6/16/49	3.0	51	121.04	133.95	0.904	2.52	.0000534	77.9	.0222	.0216
6/24/49	3.0	51	195.62	131.39	1.489	2.48	.000155	76.0	.0228	.0224

DESCRIPTION OF CHANNEL

Course: straight. Cross section: little variation in slope, for variation in size see table 2. Side slopes: quite regular. Bottom: quite regular and even except for silt bars near north bank at upper and lower ends of reach. Soil: muck on both sides, bottom excavated 6" deep into limestone, but irregularities smoothed by silt. Condition: cleaned by dragline about 12 months previously. Dense para grass growth on both upper banks. At time of above tests water stage in channel was below growth for about 2/3 of reach. In general, channel in good condition.

MAIN FARM LATERAL IN OSBORNE'S GROVE ON NORTH NEW RIVER CANAL NEAR DAVIE, FLA., LENGTH OF REACH TESTED, 1,000 FT.

6/16/49	3.6	17.6	7.75	47.55	0.163	2.34	.0000145	27.98	.0614	.0558
6/ 2/49	4.1	18.4	11.16	57.17	.195	2.61	.0000118	31.11	.0497	.0466

DESCRIPTION OF CHANNEL

Ditch blasted into lime rock and material excavated by dragline. Course; straight. Cross section: little variation in shape, for variation in size see table 2. Side slopes and lower 2/3 of ditch quite irregular due to vertical solution holes in Miami oolite limestone. Upper 1/3 fairly regular. Bottom: silt in bottom of ditch smooths out irregularities left during construction. Soil: lower 2/3 Miami oolite limestone with many vertical solution holes from 6 to 24 inches in diameter. Upper 1/3 Everglades Peat with a layer of sand about 8 inches thick lying between top of rock and peat. Condition: Ditch cleaned by dragline from west bank about 2 weeks prior to test. A little vegetation on upper part of east bank, west bank clean. No water grasses. In general, this ditch was in as good shape as feasible to put it by using dragline for maintenance.

Table 2.--Percent variation from average cross sectional area for each cross section on East Shore Drainage District and Osborne Grove slope courses

Section No.	East Shore Canal		Osborne Farm Lateral	
	Station	Percent variation	Station	Percent variation
1	0 + 05	- 11	0 + 00	+ 10
2	2 + 77	+ 4	1 + 00	- 7
3	5 + 54	+ 2	2 + 00	+ 3
4	8 + 31	- 1	3 + 00	+ 2
5	11 + 08	- 2	4 + 00	- 9
6	13 + 85	- 4	5 + 00	0
7	16 + 62	0	6 + 00	+ 5
8	19 + 40	+ 7	7 + 00	- 13
9	22 + 17	+ 5	8 + 00	+ 4
10	24 + 94	- 2	9 + 00	+ 4
11	27 + 72	- 12	10 + 00	+ 12

"The mean velocity was obtained from "Q" as determined from the flow measurements, and "A" as obtained from the weighted average using the formula V = Q/A. The difference in velocities at the upper and lower ends of the slope courses was so small that the correction factor, $V^2/2G$, was found to be so small as to be insignificant.

"Tables 1 and 2 summarize the main elevents found by those tests on which valid results were obtained. These tables appear on pages 18 and 19.

Drainage Studies - M. H. Gallatin, Homestead, Florida.-"Heavy rains occurred to June 20, and in a few areas in the north and west showers occurred later. The following table gives the totals by months for our gages for a 4-year period.

Location of gage	June 1949	June 1948	June 1947	June 1946
Redland and Mowry	12.91	5.35	20.77	9.21
Sub-Tropical Expt. Sta.	12.81	3.38	22.51	7.48
Redland and Gossman	7.28	6.19	15.34	8.56
Plummer and Comfort	10.12			
Peters Florida	5.37	7.53	15.20	7.33
Princeton Grove	10.89	6.12	15.94	9.47
Cooper Grove	10.00	4.15	14.46	8.72
W-Mowry	10.81	4.20	17.11	
F-33	7.62	3.65	13.76	
Roberts and Avocado	12.50	3.22	23.43	5.18
Jeran Grove	8.55			
Country Club and Waldin	12.05			

"As a result of the heavy rains during the early part of the period we had a rather rapid rise in the water table to June 20. From that date to the end of the month the loss in water table elevation was very rapid.

"From May 31 to June 20 gains of 1.92 to 3.78 feet were recorded for the Redland Road profile while for the period June 20 to July 5 losses ranging from 0.02 to 1.56 feet were recorded. For the northern and north western parts of the area gains of 0.02 to 0.32 foot were recorded. For the period we had gains in our water table ranging from 1.32 to 2.80 feet. The greatest increase being in the north and northwestern part of the area.

"For the Eureka profile gains in the water table from April 31 to June 20 varied from 0.87 to 2.43 feet. For the period June 20 to July 5 the loss in water table elevation was low for most of the area covered by this profile, 0.09 to 0.33 foot for the eastern end with a gain of 0.06 to 0.19 foot for the western end of the profile. For the entire period gains of 0.54 to 2.62 feet were recorded.

"For the Mowry street profile for the period May 31 to June 20 gains of 2.97 to 3.86 feet were recorded. For the period June 20 to July 5 losses recorded for this profile ranged from 0.77 to 1.58 feet. For the entire period gains ranging from 1.77 to 3.01 feet were recorded. The greatest gains in our water table were recorded in the central, western, and northwestern parts of the area.

"Readings at well No. 5, corner of Mowry Rd. and Redland for June 30 were as follows:

June 30,	1949	3.91 feet M. S. L.
" "	1948	2.34 " " " "
" "	1947	5.56 " " " "
" "	1946	4.08 " " " "

"Readings on the mulch plots during the first portion of the period were quite low due to the heavy rains. From the 20th of June to the end of the period readings in the natural cover plot and check plot increased very rapidly. Between June 24 and the 28th readings on both the natural cover and the check plot had reached the wilting point. Readings on the shaving, pine straw, and grass mulched areas increased but no nearly so rapidly.

"During the early part of the period all of the blocks in the citrus and avocado test areas remained low. From June 24 to the 28th readings increased rapidly. On June 26 blocks in the lime test area showed the trees had reached the wilting point. For the avocado test area readings increased but not to the danger point. The avocado area has a heavy layer of leaf mulch and partially decomposed material on the surface which acts as mulch. The heavy loss of moisture in the lime tree block can be accounted for in two ways. These trees put on a lot of growth and also during this period we had high dry winds. In a few instances where there was a heavy crop of fruit, irrigation was started so as not to lose the fruit.

"There is a definite trend in the area among the growers and fertilizer plants to use more inert types of nitrogen material. Our work to date has shown that losses of nitrogen are high during heavy rains where readily available types of nitrogen are used. While we are mainly interested in the rate of loss to find out if the material is suitable for use, we must have production records. During the past 2 years records have not meant much because of the high loss of fruit in the storms. It is hoped we can obtain records this year when the practice carried on in our cooperative study to determine if a low constant supply of nitrogen is more desirable than large quantities of readily available material will give us some figures.

"A new test material was put out during the early part of the period. This material Butco is a by-product of the plastic industry. Three successive samplings after application indicate that it breaks down very slowly. On the third sampling this area had only reached 35 p. p. m. of nitrate nitrogen. Our past indications are that this should be adequate for good growth and fruit production."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Ga.-"Soil moisture conditions were excellent at the beginning of the month, following the 2.26 inches of rain May 30 and 31. The rainfall record during June was: June 9 - 0.03 inch; 10 - 0.08 inch; 14 - 0.36 inch; 16 -.56 inches; 21 - 0.49 inch; 24 - 0.17 inch; 25 - 0.37 inch; 27 - 0.06 inch; totaling 2.22 inches. This was 1.85 inches less than the 4.07 inches average for the month.

"The pasture was given a 1-inch irrigation June 13. The shower on the 14th and others on subsequent days made irrigation of the vegetables and field crops unnecessary. The soil was drying out rapidly at the end of the month, however.

"Three forms of liquid nitrate fertilizer were applied to the corn in Block III through the irrigation system in cooperation with the Agronomy and Soils Department. These materials were: (1) Anhydrous ammonia, (2) Barrett's solution 4; and (3) Barrett's solution 32. All were furnished by the Barrett Division, Allied Chemical and Dye Corporation. The solution 4 contained 37.0 percent nitrogen, of which 16.6 percent was anhydrous ammonia. The solution 32 contained 32 percent nitrogen derived from ammonium nitrate and urea and containing no anhydrous ammonia.

"All these materials were applied at the rate of 176 lb/ac N (the same as our irrigated plots using dry fertilizer). The corn was severely burned with the anhydrous ammonia. There was also some burning with the solution 4 and none with the solution 32.

"The soils department made some chemical analyses of the irrigation water where the anhydrous ammonia was used. Samples were taken from the pipe before the water reached the sprinkler. Others were caught in cans on the plot where the water reached the ground. The respective concentrations were:

From the line	- 0.060 percent
from the ground	- 0.015 percent

"This indicates that 75 percent of the original concentration of ammonia was lost by volatization. The aroma of ammonia was quite strong on the plot while the water was being applied."

DIVISION OF IRRIGATION AND WATER CONSERVATION

Soil Moisture Field Capacity - V. S. Aronovici, Pomona, Calif.-"As previously reported, an attempt has been made to relate field capacity to the nature of the extraction rate curve of a saturated soil 1 inch in thickness subject to 1/3 atmosphere tension. Four ceramic plates 12 inches in diameter have been used. It has been found that the moisture content at which the extraction rate materially decreases compares favorably to observed field capacities. However, it has also been observed that extraction rate curves can be replicated on one plate, but the curves derived from the same soil on a second plate may be slightly too markedly different. This is due to the influence of the pore characteristics of the plates themselves. Each plate will have a characteristic curve of its own and will influence the resulting soil curve.

"Two alternatives are possible: First, to design and construct the ceramic plates to rigid pore characteristic specifications. This is impossible under present manufacturing techniques. The second alternative is to derive correction factors for each plate. It is in this direction that effort is now being placed. Tabulated below are replicated results of extraction curves using two soils and four ceramic plates."

Influence of pore characteristics of ceramic tension plates on soil moisture extraction rates at one third atmosphere tension.

Soil type	Plate	Extraction time in hours								
		0	1	2	4	6	24	48	72	96
		(Percent moisture on dry weight basis) 1/								
Hanford loamy sand	L	24.5	16.5	15.0	13.3	12.4	10.7	10.1	9.5	9.3
	R	25.2	17.5	14.9	12.6	11.6	10.2	9.5	8.9	8.7
	A	24.8	12.5	11.6	11.0	10.4	9.5	9.0	8.6	8.5
	B	24.9	13.5	12.3	11.1	10.7	9.4	8.8	8.5	8.3
Chino clay	L	62.2	46.8	45.7	44.4	43.3	41.6	40.6	40.1	39.6
	R	61.5	47.3	45.2	43.2	42.3	40.3	39.5	38.9	38.4
	A	59.6	43.5	43.0	41.8	41.4	39.7	38.9	38.7	37.9
	B	60.4	44.4	43.4	42.8	42.4	41.4	40.4	39.8	39.4

1/Each tabulation is based on three sample observations.

Rainfall and Irrigation Water Penetration - G. M. Litz, Los Angeles, Calif.-"Preliminary estimates of rainfall and irrigation water penetration below the root zone for the seven winter months, October to April, on grass and lawn and on truck crops, were calculated for each rainfall year from 1921-22 to 1941-42 for the West Coast Basin. These calculations indicate that the amount of penetration is influenced more by how precipitation actually occurred than by the seasonal amount of rainfall and also that the average irrigation practices during the winter months, when the transpiration rate is low, will tend to produce some penetration almost every year.

Leaching Studies - George B. Bradshaw, Imperial, California.-"In March of 1949, an intermittent, alternately wetting and drying, leaching study for the removal of excess salts was intiated on a 140-acre tract of land located northeast of El Centro. A sub-surface tile drainage system, with laterals spaced at 337 feet, was installed in this tract, in November 1948. The soils ranged from medium to heavy textured and were very saline to a depth of 5 or 6 feet.

A series of soil samples at various locations in the tract showed a salinity ranging from 30 to 102 tons of salt per acre-foot in the surface foot of soil. At a depth of 20 feet, the salt content of the soil had decreased to 8 or 9 tons per acre-foot.

"The following results were obtained during the first 30-day leaching period.

Acre-feet of leaching water applied	188
Tons of salt applied in the leach water	243
Acre-feet of surface waste water	63
Tons of salt removed in the waste water	380
Acre-feet of water removed by the tile drainage system	14.14
Tons of salt removed by the tile drainage system	858
Acre-feet of water evaporated from the surface during the first 30-day leaching period	103

Results of the first leaching period indicate 137 tons of salt, 0.98 tons per acre, were removed from the soil by the surface waste water. 858 tons of salt, 6.13 tons per acre, were removed by the tile drainage system. The combined removal of salt by the surface waste and the tile drainage system amounts to approximately 7.1 tons of salt per acre. Eight acre-feet of leaching water was computed as going to deep seepage. This deep seepage will remove some salt and will be indicated by subsequent soil analysis."

Alkali Reclamation Investigations - Boise, Idaho.-Mr. James C. Marr returned to this office from leave for a re-evaluation of the alkali reclamation plots at Caldwell, Idaho. Various chemical and cultural treatments and practices were tried on these plots during the period 1926 to 1932. The Bureau of Reclamation particularly was desirous of knowing what residual effect might be expected from these various treatments over the long period of time. Soil samples were obtained from the various plots and analyzed by the Regional Bureau of Reclamation office. The results of these analysis were compared with the results of similar analysis made at the beginning and during the study period. Although chemical analysis did not appear to show much change in the alkali condition of the soils, permeability tests made by the double ring method do show some variation. Further study of intake rates are being made to incorporate in a report of the present conditions of the plots.

Reno, Nevada - Clyde E. Houston.-A joint working plan of Nevada Agricultural Experiment Station, Nevada State Engineer, and Soil Conservation Service, Research, was completed and signed by State Engineer Smith, Station Director Fleming, and myself, and forwarded to Logan for final approval. This plan for the study of the use of water by agricultural crops and native vegetation in Nevada will be conducted under the general cooperative agreement between the above agencies. The objectives of the study are to determine:

(a) Basic consumptive use of the more important agricultural crops grown in Nevada.

(b)Irrigation efficiencies practical and feasible under Nevada conditions.

(c) Resulting water application requirements and farm deliveries.
(d) Use of water by phroatophytes in irrigated and irrigable areas of Nevada.

The 1944 Census lists approximately 700,000 acres of irrigated land in Nevada. The amount of water applied annually to a large part of this area has never been measured, nor have any formal studies been made to determine the amount of water required by crops in Nevada for satisfactory crop production.

Observation of irrigation practices and reported decrease in crop yields and soil fertility indicate that better than half of the 700,000 acres is over irrigated. Additional areas might be irrigated through more efficient use of present water supplies.

Management of Related Irrigation and Drainage Enterprises, R-3-5-1 - J. H. Maughan, Logan, Utah.-The effects of irrigation often reach beyond the area that is irrigated. This is well exemplified by a small area of perhaps 500 acres of sandy soil served by the Preston-Whitney Canal, southwest of Preston, Idaho. The highly permeable soil admits the water freely and this area is the beginning point for widespread irrigation and drainage problems. On the one hand water-logging is apparent on lower lands, outside the area served by this company and the source of this trouble is readily traceable to irrigation of the sandy soils situated above.

On the other side of the area, overlooking the Bear River valley, gully erosion is rapidly developing. At one point a huge arroyo is forming which threatens to sever the irrigation canal and engulf much of the irrigated land. During the past 2 years a chasm has developed about 100 feet deep at the outlet and roughly 40 rods wide and 60 rods long. As a result of repeated excessive irrigation nearby, this erosion began as a small earthflow on the brink of the Bear River valley. Eating its way backward, the gully formed rapidly as the saturated soil at the bottom was carried away by the seepage water. Increasing in volume to perhaps 1 c. f. s., this seepage flow incessantly "melts" and carries away the soil at the bottom as the insecure sand at the sides caves and slides in.

The arroyo has already reached to within a few rods of the irrigation canal and this spring the canal was moved about 80 rods farther inland.

Still another problem has arisen. The silt thus being dumped into Bear River is clogging the channel, changing the course of the river and doing great damage to irrigation diversions down stream.

Significantly the incidence of the problems arising from irrigation of this area extend beyond the bounds of the 500 acres, or even the irrigation company serving the area. Thus, the interrelation of irrigation enterprises may be very close. The management of one may create the problems of another.

Garden City, Kansas - W. R. Meyer.- The second of June we started replanting the 18 acres of beets to be used on the length of run study. The ridge cover method was used and half of the plots on 60 percent level were irrigated so as to have enough moisture to germinate, but as it turned out it was a waste of time for on the morning of the 3d we recorded 0.90 inch of rain, the 4th 1.39 inches, the 5th 4.75 inches, the 7th. 0.24 inch, 9th 0.52 inch, 11th 0.05 inch, 13th 2.32 inches, and the 14th 0.11 inch, which made a total of

10.28 inches.

Due to the rain it was impossible to get into the fields to knock off the ridge covers, consequently on some plots a poor stand of beets resulted; however, they are looking much better now.

On June 8 a few moisture samples were collected and we found that the moisture content in the first 2 feet was above field capacity, so we waited until the 15th and took samples to find that only the first 2 or 3 feet were affected by the wet weather, with exception of the plots where we had irrigated and in those we had good moisture down to 4 or 5 feet.

Water Law Study Revision - "Selected Problems in the Law of Water Rights in the West." - Wells A. Hutchins, Berkeley, Calif.-Except for 1 day, the entire month was spent on this project. Of the 21 days given to it, 12 days were spent in the Alameda County Law Library in Oakland and 9 days in the Berkeley office. About two-thirds of the time was taken in reviewing and briefing the Idaho water-right cases, which were completed down to 1942 or as far as the State reports have been printed, and the balance on cases from Alabama, Arizona, Kansas, and Montana.

8/16/49

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